Trip to Sunshine Coast Queensland, September 2004
Visit to Schools

Report No 2002-059-B No 7

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EXECUTIVE SUMMARY

A trip was undertaken to look at concerns of Public Works and Main Roads Departments of Queensland. David Paterson and Wayne Ganther from CSIRO travelled to the Sunshine Coast with Alan Carse of Queensland Department of Main Roads and Michael Ball of Queensland Department of Public Works. We were also joined for part of the visits by Ed Bowers of QBuild which is a commercial unit of Public Works responsible for maintenance of Public Works.

During the trip we visited a bridge on the David Low Way at Sunrise Beach near Noosa. This bridge was in a severe marine environment with high salt content in the concrete and corrosion of the galvanised handrails and barriers. This is discussed in the *Visit to Bridge and Foreshore* Report 2002-059-B No 8.
This report covers the visit to four schools north of Caloundra.

- Currimundi State School and Currimundi Special School which are located within 100 metres of the ocean at Dicky Beach, Currimundi and have significant corrosion problems.
- Talara Primary College which is approximately 2 km inland from Dicky beach west of the Currimundi Schools.
- Kawana State High School

All of the schools have significant corrosion problems. Most of the corrosion issues relate to sheltered corrosion and have been seen in similar structures in Victoria. The main structures affected are covered walkways and shelters ie. all areas where salt can be deposited and is not washed away. Another problem is roof fasteners which have corroded; this may be due to inappropriate specifications as some fasteners were stainless steel and performing well. Other corrosion problems are due to inappropriate design, specifications or building practice.

1 INTRODUCTION

As part of the CRC for Construction Innovation project on Case Based Reasoning a trip was undertaken to look at concerns of Public Works and Main Roads Departments of Queensland, these organisations being the project's industrial partners. David Paterson and Wayne Ganther from CSIRO travelled to the Sunshine Coast with Alan Carse of Queensland Department of Main Roads and Michael Ball of Queensland Department of Public Works. We were also joined for part of the visits by Ed Bowers of QBuild which is a commercial unit of Public Works responsible for maintenance of Public Works. The Sunshine Coast area was chosen for the visit due its coastal location and known corrosion problems.

2 INSPECTION AT SCHOOLS

Four schools were visited on the Sunshine Coast, Currimundi State School, Currimundi Special School, Talara Primary College and Kawana Waters State High School.

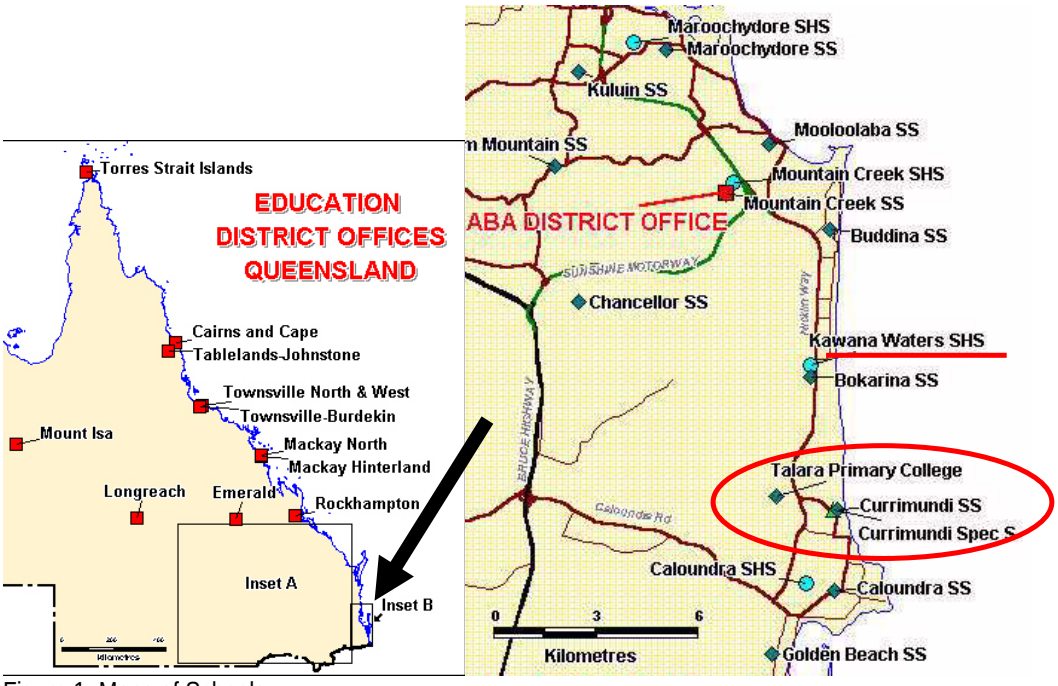

Figure 1 Maps of Schools

2.1 Currimundi State School

Currimundi State School is located within a couple of hundred metres of the beach as seen in
Figure 2. The school was opened in 1977 and the buildings shown are between 4 and 12 years old.
The main issues seen here were corrosion and deterioration of Colorbond gutters around joins and fastening points, corrosion of metallic components in sheltered areas, metal building supports in sub floor and gang nails in roof areas, and corrosion of roof fasteners. There was also substantial corrosion on the underside of roof sheeting of walkways and covered play areas. The exposed roof surfaces looked to be in good condition. We did not look inside the roof spaces of any of the buildings.
At this school we installed a salt candle which will be changed by the students over the next couple of months.

Figure 2 Aerial Photograph of Currimundi State school

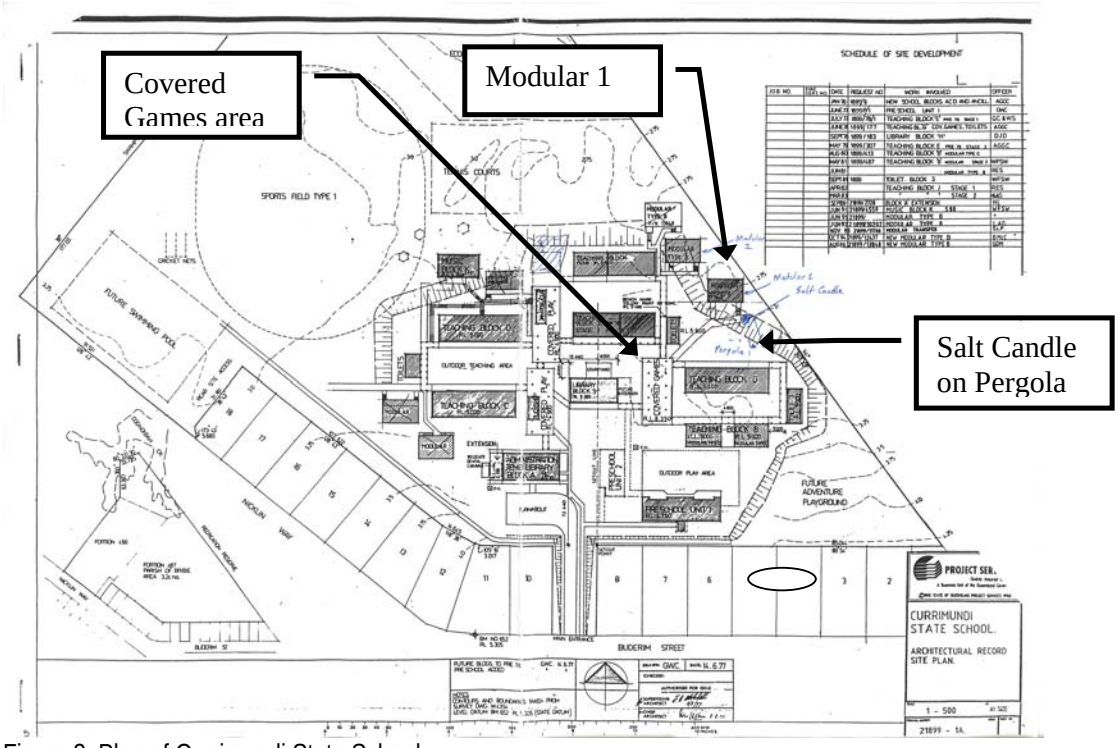

Figure 3 Plan of Currimundi State School

Figure 4 Location of Salt Candle at Currimundi State School

Figure 5 Modular 1 class room at Currimundi State School

Figure 6 Rusting and deterioration on gutter on Modular 1

Figure 7 Close up of rusting and deterioration on gutter on Modular 1 showing that problems are associated with the joints.

Figure 8 Sub-floor of Modular 1 showing significant deterioration of sub floor metallic components.

Figure 9 Stump support of Modular 1.

Figure 10 Close up of stump of Modular 1.

Figure 11 West end of roof of Modular 1.

Figure 12 Fasteners on roof of Modular 1 showing rust staining on to sheeting.

Figure 13 Fasteners on roof of Modular 1 showing rust staining on to sheeting.

Figure 14 Covered games area.

Figure 15 Footing of steel support showing red corrosion product.

Figure 16 End of steel beam showing red rust break through.

Figure 17 Inside covered games area showing corrosion of underside of roof sheeting and rust on edges of beams.

Figure 18 Inside covered games area showing corrosion of underside of roof sheeting and rust on painted gang nail plates.

Figure 19 Close up of gang nail plates on inside of covered games area.

Figure 20 Close up of inside of roof sheeting of covered games area showing significant white corrosion product and some red rust.

Figure 21 Close up of inside of roof sheeting of covered games area showing significant white corrosion product.

2.2 Currimundi Special School

The Special school is located across the road from the State School. The school was opened in 1984. It has the same sorts of problems as the State school. It is in the process of being rebuilt and there are some problems with the installation of some components.

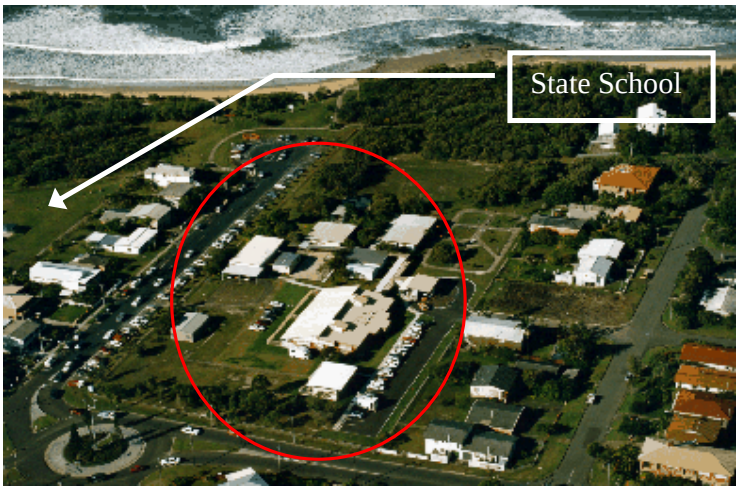

Figure 22 Currimundi Special School.

Figure 23 Stainless steel equipment box showing signs of rust where signs were affixed with tape.

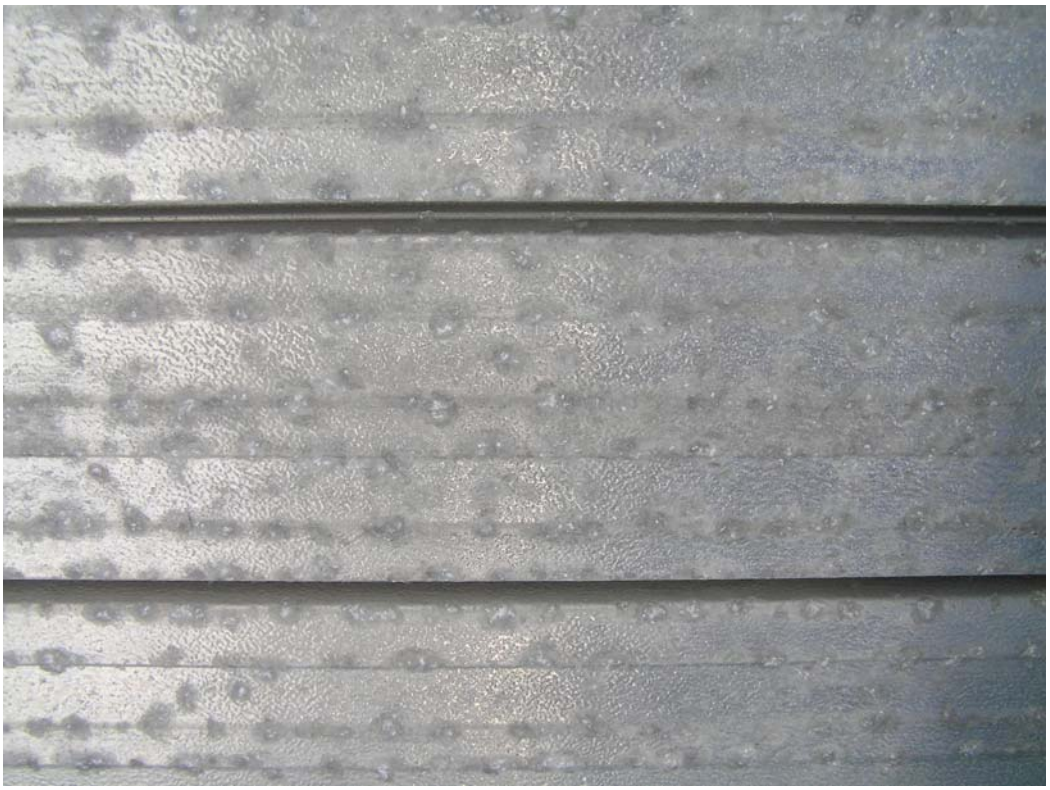

Figure 24 Close up of covered walkway showing significant white corrosion product, possibly aluminium construction.

Figure 25 Covered walkway showing corrosion of galvanised support.

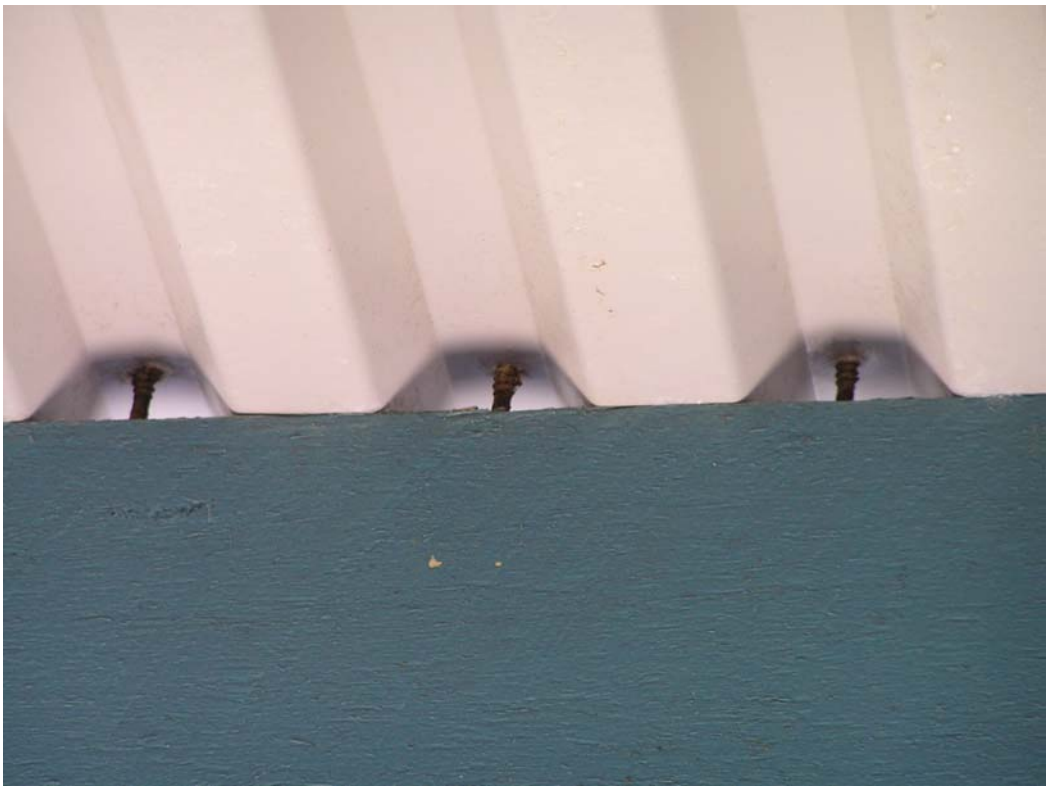

Figure 26 Covered walkway, fastener shanks are red rust and undercutting seen on Colorbond sheeting.

Figure 27 Covered walkway, fastener shanks are red rust and undercutting seen on Colorbond sheeting.

The following figures show an attempt at building with more corrosion resistant components but actually causing additional problems. Stainless steel strapping was used in the construction of the Covered set down but it is in contact with the Colorbond roof sheeting. The strap that is not in contact is corroding and the strap in contact with the Colorbond is causing the Colorbond to corrode. The Colorbond is showing significant red rust and will in the near future if it hasn't already, corrode through. This could have been avoided by making sure the strapping did not touch the Colorbond sheeting.

Figure 28 Covered set down structure.

Figure 29 Covered set down showing red rust of stainless steel strapping not in contact with roof sheeting and red rust on roof sheeting where stainless steel strapping is in contact.

Figure 30 Close up showing red rust of stainless steel strapping not in contact with roof sheeting and red rust on roof sheeting where stainless steel strapping is in contact.

Figure 31 Close up showing red rust of stainless steel strapping not in contact with roof sheeting and red rust on roof sheeting where stainless steel strapping is in contact.

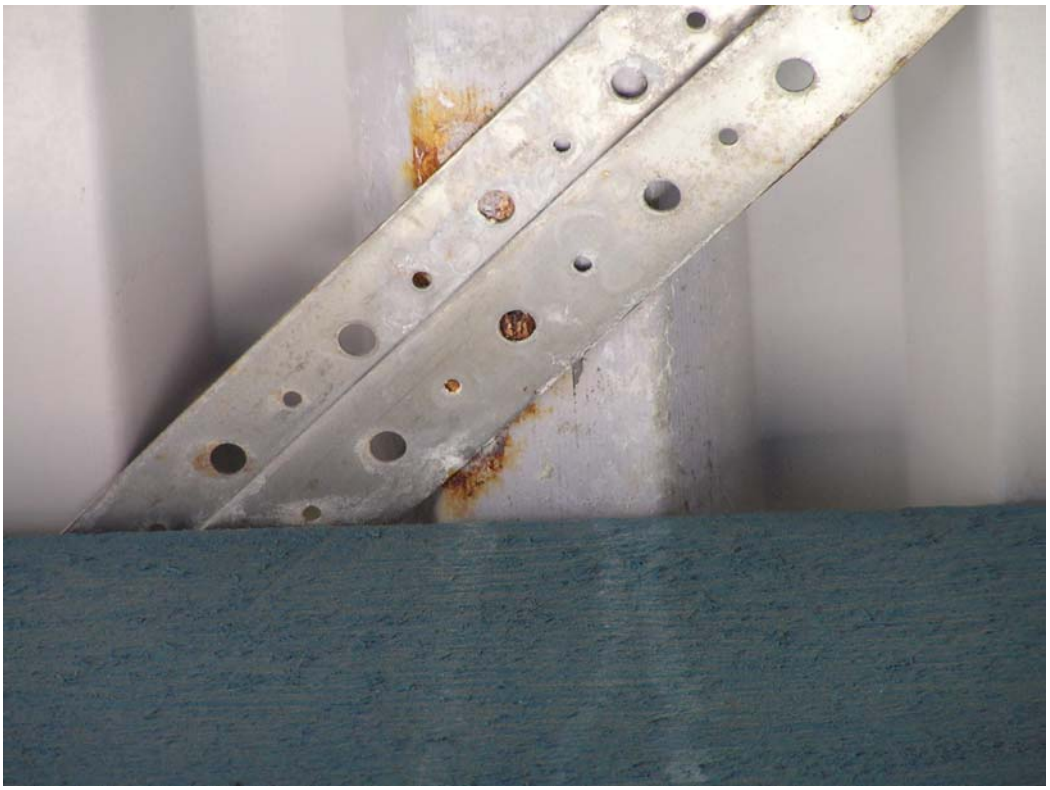

Figure 32 Close up showing red rust on roof sheeting where stainless steel strapping is in contact.

Figure 33 Triple grips on structure of covered set down showing signs of deterioration and roof fastener shank to red rust.

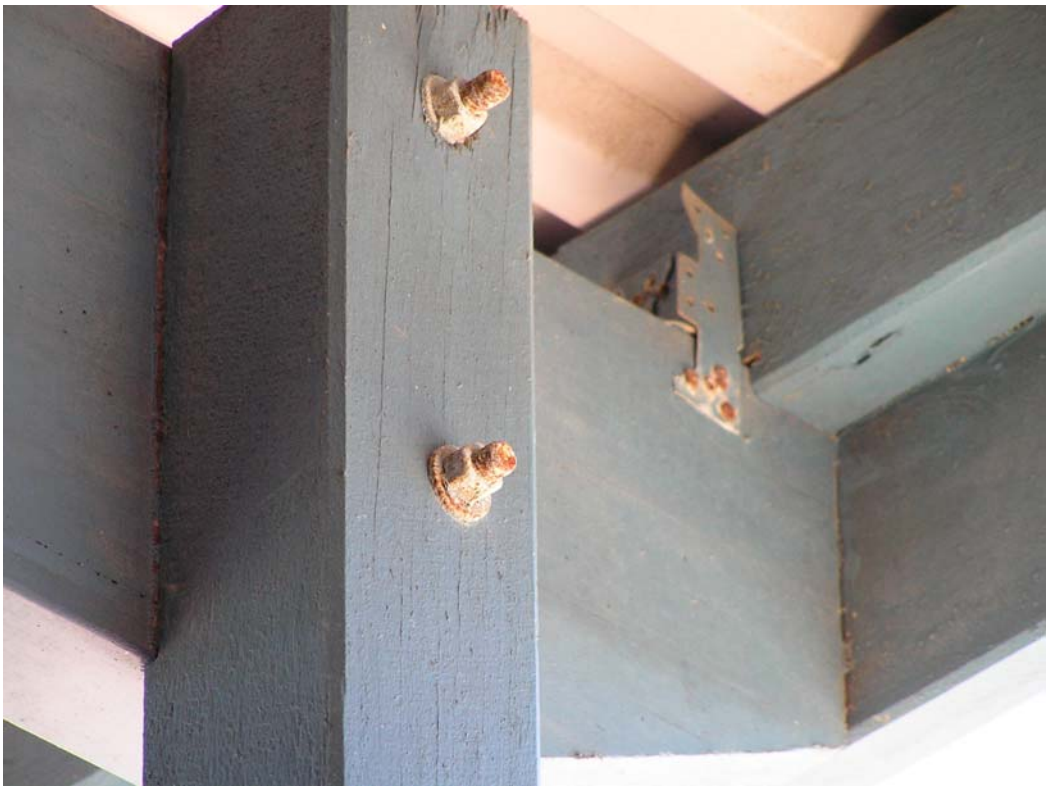

Figure 34 Triple grips and bolts on structure of covered set down showing signs of deterioration.

2.3 Talara Primary College

This school is located approximately 2 kilometres from the coast almost directly west of the Currimundi schools. The school was opened in 1998 and Block E was only opened in 2004. It also shows the same issues as the other schools. A salt Candle was installed here and will be changed by the students.

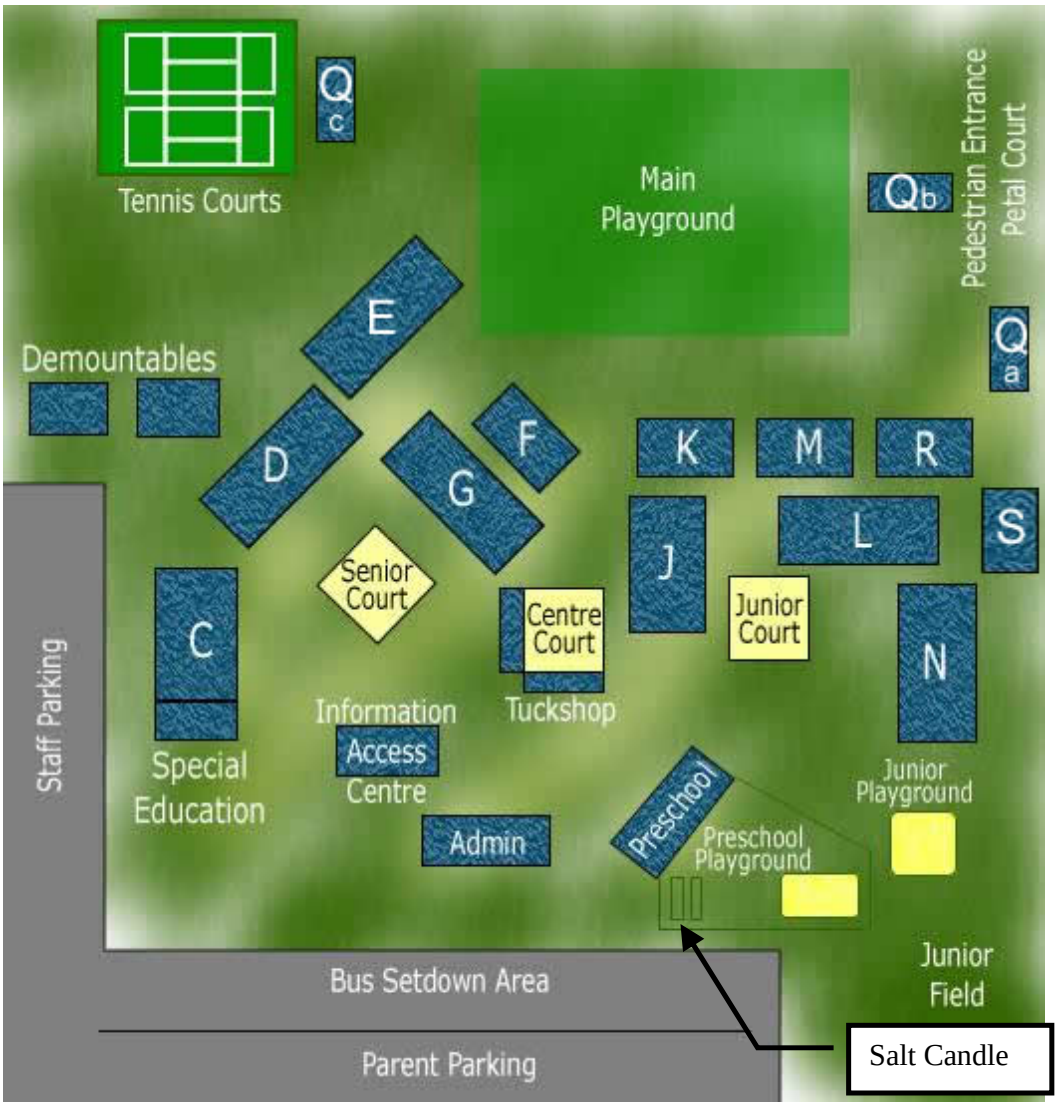

Figure 35 Layout of Talara College, walkways are not shown.

Figure 36 Talara Primary College Administration Block.

Figure 37 Fasteners in sheeting on porch of Administration Block.

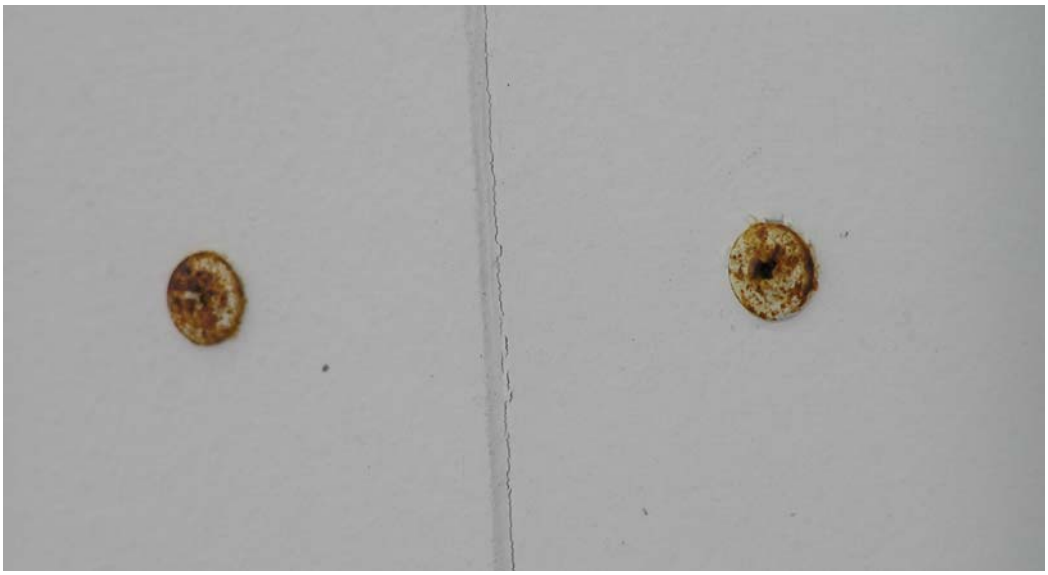

Figure 38 Close up of Fasteners in sheeting on porch of Administration Block.

Figure 39 Galvanised post on Administration Block and close up showing signs of white corrosion product.

Figure 40 View of the school from the east side showing the Pre-School to the left and the Junior playground to the right.

Figure 41 Rust on fasteners on Block N.

Figure 42 Covered court.

Figure 43 Corroded strapping on covered court.

Figure 44 Corroded fasteners in covered walkway.

Figure 45 Corroded fasteners in covered walkway.

Figure 46 Roof of building, heads of fasteners and roof in good condition.

Figure 47 View from north of school showing Centre Court and block G.

Figure 48 View to walkway from 2nd floor of Block E.

Figure 49 Inside gutter of walkway from block E.

Figure 50 Roof of covered walkway from block G showing rust stains from discarded swarf.

Figure 51 View of school from 2nd storey of Block E.

Figure 52 Degradation of gutter at join.

Figure 53 Close up of degradation of gutter at join, note pop rivets corroded away.

Figure 54 Close up of degradation of gutter at join, note pop rivets corroded away.

Figure 55 Corroded fastener under covered area, sheeting also showing undercutting.

Figure 56 Salt candle installation at Talara College Primary School, in Pre-School playground.

Figure 57, View from Salt candle installation at Talara College Primary School.

2.4 Kawana Waters State High School

This school is approximately 1 kilometre from the coast and approximately 4 kilometres north of Currimundi. The school was opened in 1986. The school has similar problems to the other schools in terms of sheltered corrosion and selection of roof fasteners, but also shows examples of good used of materials as well as inappropriate but well intentioned use of materials.
A salt candle was installed here and will be changed by the students.

Figure 58 The Kawana Waters State High School sign outside the school.

Figure 59 Position of Salt candle shelter at Kawana Waters High School.

Figure 60 View to the South east from the salt candle shelter.

Figure 61 View to the East from the salt candle shelter.

Figure 62 View to the North from the salt candle shelter.

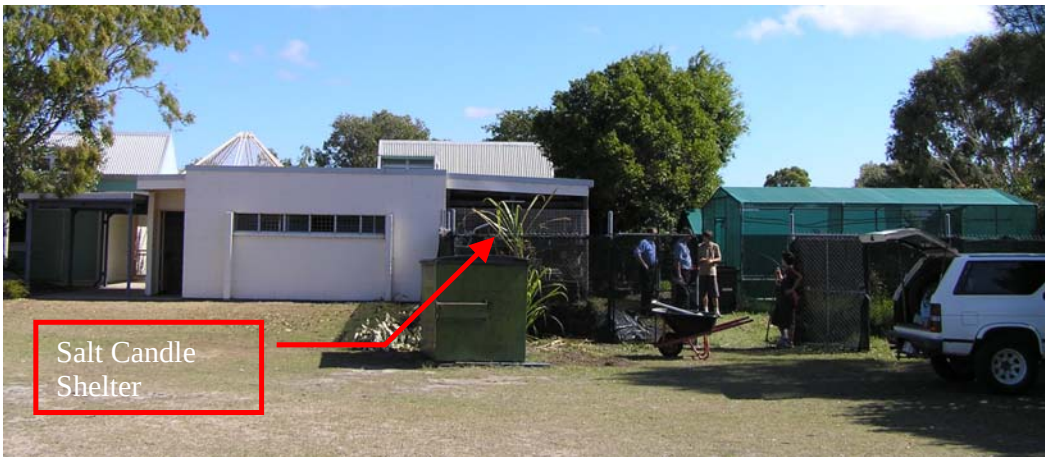

Figure 63 View of area where salt candle is located.

On some covered walkways square section steel was used as downpipes. It is assumed the steel was used as standard downpipes would be destroyed by the students. It can be seen in the following figures that the painted steel is corroding from the inside out.

Figure 64 Covered walkway showing timber support and steel down pipe.

Figure 65 Bottom of square section, steel completely rusted away.

Figure 66 Top of downpipe also showing rusting of bracket from downpipe to support and stainless steel plates on walkway beams.

Figure 67 Close up of downpipe bracket and stainless steel connector plate.

The aluminium sheeting used on the walkways looked ok on the exposed outer surface but underneath there was significant corrosion. It looked like galvanised fasteners were used to fasten the sheeting and these where corroded on the heads, some to 100% red rust. The shanks of all the fasteners where heavily corroded.

The colorbond walkways looked newer than the aluminium ones. The colorbond showed no signs of deterioration on the exposed surface or underneath, although there was significant biological growth on the colorbond. The fasteners used were stainless steel with aluminium cyclone plates and these were in good condition on the heads and shanks. There was no undercutting of the colorbond.

All the aluminium gutters showed corrosion on the underneath side, even on the colorbond walkways. As with the other schools where joins were made in the gutters significant deterioration had occurred.

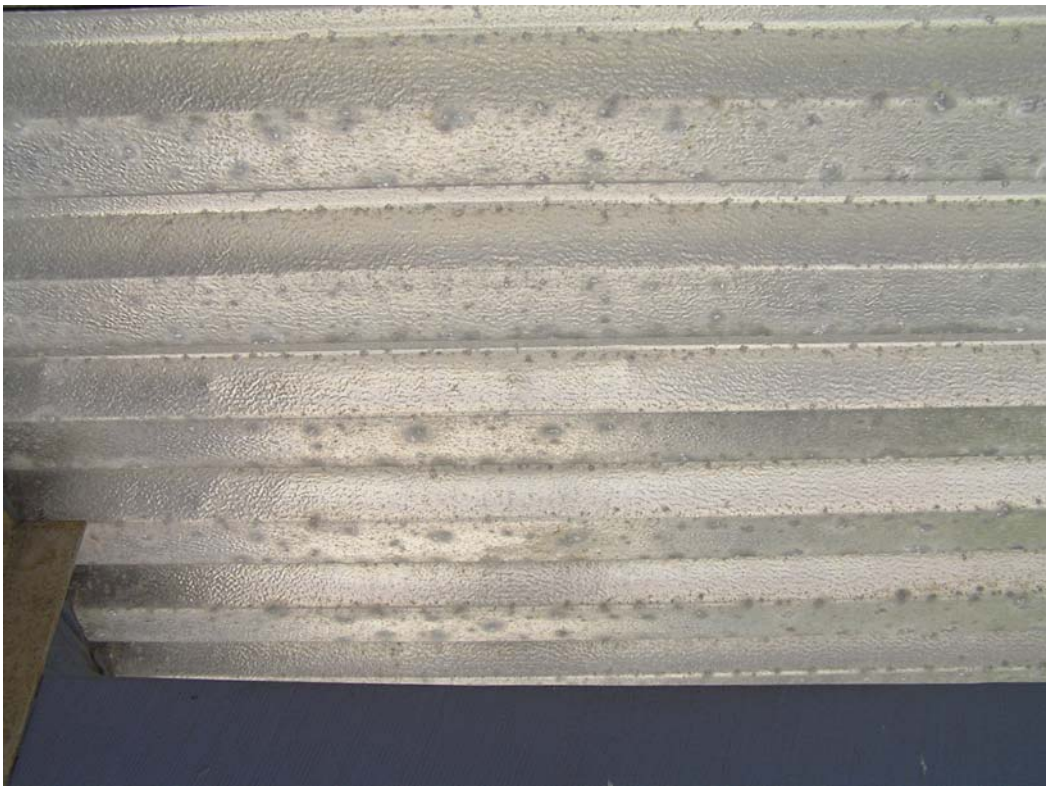

Figure 68 Underside of aluminium roof sheeting of covered walkway.

Figure 69 Close up of underside of aluminium roof sheeting of covered walkway.

Figure 70 Heavily corroded fastener in sheeting of covered walkway.

Figure 71 Heavily corroded fastener in sheeting of covered walkway.

Figure 72 Heavily corroded fastener in sheeting of covered walkway.

Figure 73 Exposed surface of aluminium walkway in good condition, note cyclone plates.

Figure 74 Exposed surface of aluminium walkway in good condition.

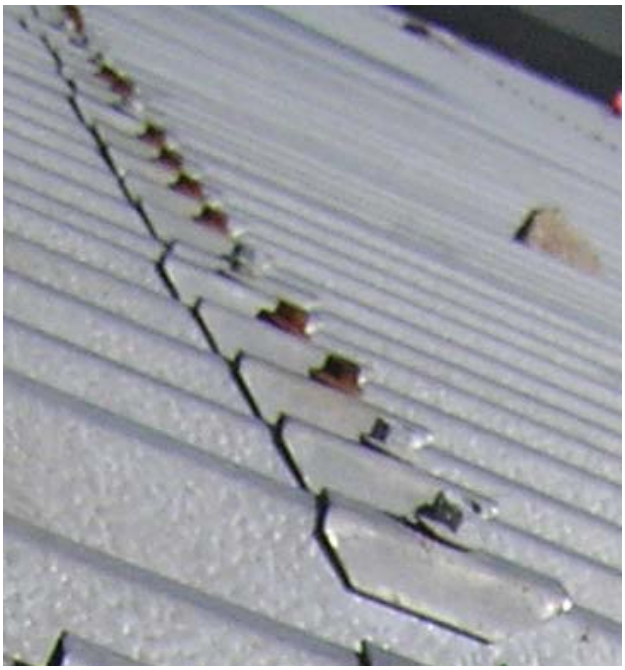

Figure 75 Close up of above figure showing fasteners with red rust.

Figure 76 Exposed surface of aluminium walkway in good condition.

Figure 77 Exposed surface of aluminium walkway in good condition.

Figure 78 Close up of fasteners showing red rust and white corrosion product.

Figure 79 Colorbond walkways with aluminium gutters.

Figure 80 Colorbond walkways with aluminium gutters which are full of leaves and dirt.

Figure 81 , Colorbond walkway.

Figure 82 Colorbond walkway with aluminium gutters and stainless steel fasteners and aluminium cyclone plates.

Figure 83 Inside gutters, although dirty, looked to be in OK condition.

Figure 84 Inside gutters, although dirty, looked to be in OK condition.

Figure 85 Inside gutters, although dirty, looked to be in OK condition.

Figure 86 Underside of all gutters were significantly corroded.

Figure 87 Underside of gutters.

Figure 88 Underside of Colorbond walkways in good condition, some deterioration of painted steel supports.

Figure 89 Close up of painted steel supports showing some deterioration of paint and some break through of rust and white corrosion product.

Figure 90 White corrosion product on painted steel brackets.

Figure 91 Joint between two walkways showing the used of galvanised flashing which has significant white corrosion product.

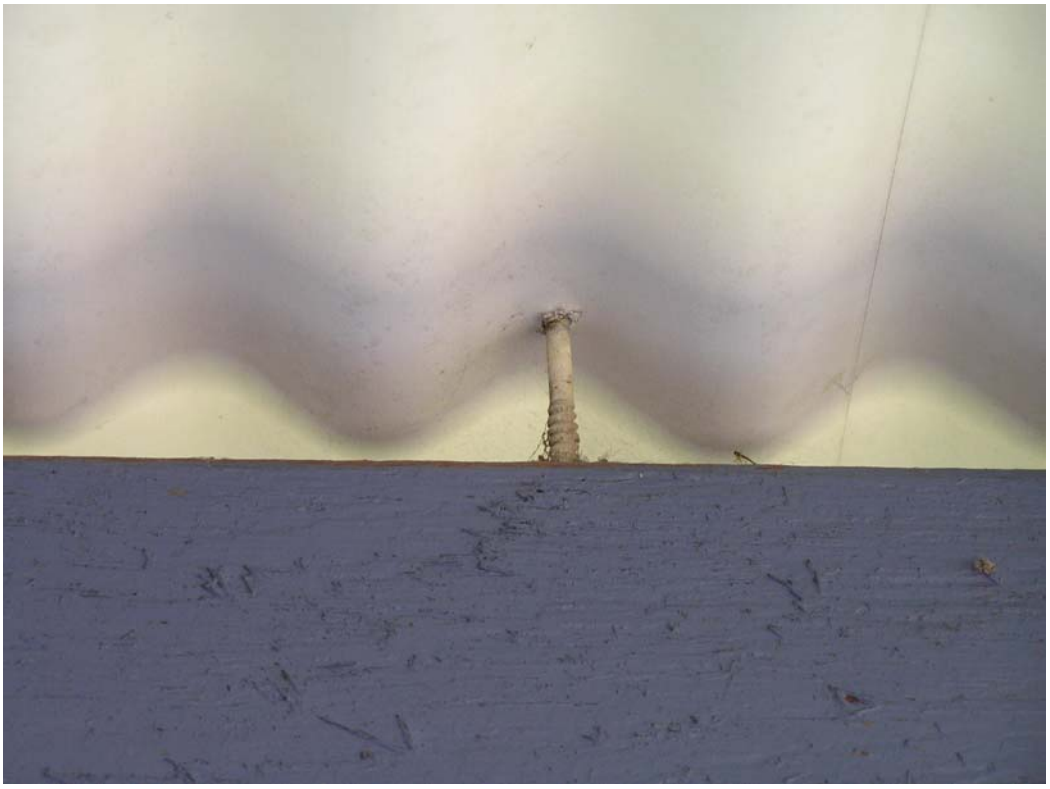

Figure 92 Shank of stainless steel fastener in Colorbond walkway, no deterioration.

Figure 93 Colorbond sheeting and aluminium gutter showing significant growths.

Figure 94 Colorbond sheeting and aluminium gutter showing significant growths.

Figure 95 Deterioration around joint between gutter and downpipe (note loss of rivet heads).

Another problem seen at this school is the use of structural downpipes. This is where as seen in the following figures the downpipe forms part of the structure holding up the eaves of the building. There is a steel U section around the edge of the eave with a piece of timber inside it. The U section is bolted to the downpipe. What seems to be happening is that the gutters, which are a fairly small diameter, block up. The water then overflows at the downpipe onto the U section and corrodes the U section and the timber is wet helping the corrosion. It was said that it costs $80,000 to replace the steel U sections on one building.

Figure 96 Structural downpipes.

Figure 97 Structural downpipes.

Figure 98 Structural downpipe showing that water has come through the join to the gutter and the infill panel has water damage.

Figure 99 Structural downpipe showing that water has come through the join to the gutter and the infill panel has water damage.

Figure 100 Structural downpipe showing that water has come through the join to the gutter and red rust can be seen in U section.

Figure 101 Base of the downpipe.

Figure 102 Looking at U section from under the eave, red rust can be seen along steel.

Figure103 Close up of U section, red rust can be seen and also the wood beam which is rotting.

Figure 104 Close up of U section showing significant red rust.

3 OTHER ISSUES RAISED

The use of fasteners without cyclone plates was noted. As corrosion of the shanks of roof fasteners was seen and undercutting of the roof sheeting, the concern was raised that if a cyclone or other severe weather event hit this region the fasteners could fail or the roof sheeting could fail resulting in the roof sheeting lifting.

4 ADDRESS AND CONTACTS FOR SCHOOLS VISITED

Currimundi State School
Principal Richard Wilkinson ph (07) 54366888
Email rwilk30@eq.edu.au
Install Salt Test
Teacher visited Bevan Hore
Addresses
Currimundi State School
17 Buderim Street
Caloundra
Q 4551

Postal address
Currimundi State School
PO BOX 159
Caloundra
Q 4551

Currimundi Special School
Principal Alwin Green ph (07) 54913684
No Salt Test

Talara Primary College
Principal Steve Adams ph (07) 54936155
Registrar Kerry Natoli
Email knato2@eq.edu.au
Install Salt test
Teacher Visited Sandra Chaplin (Email schap46@eq.edu.au)
Postal address
PO Box 3707, Caloundra DC 4551
Delivery address
Talara Street, Currimundi 4551

Kawana State High School
Principal Joe Hause ph (07) 54933388
Registrar Deb Egan
Email degan4@eq.edu.au
Install Salt Test
Teacher Visited Jim Bailey Head of Department - Science.

Postal address:
Kawana Waters State High School
P.O. Box 84
WURTULLA QLD 4575

Delivery address:
Sportsmans Parade
BOKARINA QLD 4575

5 CONCLUSIONS

At the Schools, all of the corrosion problems were due to inappropriate design, specifications or building practice, individually or in combination.

As far as gutters are concerned the problems were from sheltered corrosion or installation practice. Sheltered corrosion is where the underside of the gutters are heavily corroded due to the accumulation of deposited salts. The salts accumulate as the under side of the gutters are sheltered from the rain. The insides of the gutters seemed to be in an appropriate condition. Installation practice included problems associated with joins including the cutting of the guttering and joining by pop rivets

and fasteners. The only problems seen with Colorbond® gutters were with installation practice.

Roof sheeting was also mainly affected by sheltered corrosion. That is the top side of the sheeting was in good condition but where exposed, the underside was corroding significantly. Some of the roofs had all the fastener heads to red rust. Exposed fastener shanks were also to red rust. These fasteners looked to be galvanised and the class could not be identified at this time. These fasteners were also causing undercutting of the roof sheeting on Colorbond® roofs. Roofs with stainless steel fasteners looked in good condition.